

Amendments to the Claims

Please amend claims 1, 15, 26, 33 and add new claims 37 and 38 as indicated below. All claims are listed below, with currently amended claims so marked. This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1 1. (Currently Amended) A method of processing a video stream,
2 comprising:
3 (a) detecting a request to randomly access a particular frame;
4 (b) maintaining a list of frame dependencies identifying at least a set of frames
5 required to decode the particular frame; and
6 (c) determining based at least in part on the list of frame dependencies whether
7 a decoded version of the particular frame is in a decoded frame cache, said cache
8 configured to store an arbitrary number of previously decoded frames, and if it is not
9 and if the particular frame has a frame dependency:
10 (i) determining a frame dependency for the particular frame;
11 (ii) determining which of the frames in the frame dependency are in the
12 decoded frame cache;
13 (iii) decoding any frame in the frame dependency that is not in the
14 decoded frame cache and placing it in the decoded frame cache; and
15 (iv) using at least one of the decoded frames in the frame dependency to
16 decode the particular frame to create a decoded version of the particular frame.
- 17 2. (Previously Presented) The method of claim 1, wherein the request to
18 playback a particular frame is part of a request to perform frame-by-frame backward
19 playback and part (c) is performed for successively earlier frames with respect to the
20 particular frame as part of the frame-by-frame backward playback.

1 3. (Original) The method of claim 1, wherein part (i) is performed whether
2 or not it is determined that a decoded version of a particular frame is in the decoded
3 frame cache without part (iv) being performed.

4 4. (Original) The method of claim 1, wherein the particular frame may be
5 an I, P, or B frame of MPEG compressed video.

6 5. (Original) The method of claim 1, wherein the frame dependency is an
7 immediate frame dependency.

8 6. (Previously Presented) The method of claim 5, wherein the at least
9 some of the decoded frames referred to in part (iv) are those frames in the immediate
10 dependency.

11 7. (Previously Presented) The method of claim 5, wherein part (c)
12 includes recursion where frames in the immediate frame dependency of the frame of
13 interest are not in the decoded frame cache.

14 8. (Previously Presented) The method of claim 1, wherein part (c)
15 includes a loop with a terminating condition that all frames on which the particular frame
16 is dependent have been decoded.

17 9. (Original) The method of claim 1, wherein decoded frames are
18 replaced in the decoded frame cache according to a least recently used policy.

19 10. (Original) The method of claim 1, wherein an index is used to
20 represent each frame in the frame dependency.

21 11. (Original) The method of claim 1, wherein the frame dependency is
22 determined through a look-up table.

1 12. (Original) The method of claim 11, wherein the frame dependency is
2 determined through successive uses of a look-up table.

3 13. (Original) The method of claim 1, wherein the decoded frame cache
4 includes a data structure.

5 14. (Original) The method of claim 1, wherein the decoded frame cache
6 includes a section of main memory.

7 15. (Currently Amended) An article comprising:
8 a computer readable medium having instructions thereon which when executed
9 cause a computer to:

10 (a) detect a request to randomly access a particular frame; and

11 (b) maintaining a list of frame dependencies identifying at least a set of frames
12 required to decode the particular frame;

13 (c) determine base at least in part on the list of frame dependencies whether a
14 decoded version of the particular frame is in a decoded frame cache, said cache
15 configured to store an arbitrary number of previously decoded frames, and if it is not
16 and if the particular frame has a frame dependency:

17 (i) determine a frame dependency for the particular frame;

18 (ii) determine which of the frames in the frame dependency are in the
19 decoded frame cache;

20 (iii) decode any frame in the frame dependency that is not in the decoded
21 frame cache and place it in the decoded frame cache; and

22 (iv) use at least and of the decoded frames in the frame dependency to
23 decode the particular frame to create a decoded version of the particular frame.

24 16. (Previously Presented) The article of claim 15, wherein the request to
25 playback a particular frame is part of a request to perform frame-by-frame backward

1 playback and part (c) is performed for successively earlier frames with respect to the
2 particular frame as part of the frame-by-frame backward playback.

3 17. (Original) The article of claim 15, wherein part (i) is performed whether
4 or not it is determined that a decoded version of a particular frame is in the decoded
5 frame cache without part (iv) being performed.

6 18. (Original) The article of claim 15, wherein the frame dependency is an
7 immediate frame dependency.

8 19. (Previously Presented) The article of claim 18, wherein the at least
9 some of the decoded frames referred to in part (iv) are those frames in the immediate
10 dependency.

11 20. (Previously Presented) The article of claim 18, wherein part (c)
12 includes recursion where frames in the immediate frame dependency of the frame of
13 interest are not in the decoded frame cache.

14 21. (Previously Presented) The article of claim 15, wherein part (c)
15 includes a loop with a terminating condition that all frames on which the particular frame
16 is dependent have been decoded.

17 22. (Original) The article of claim 15, wherein decoded frames are
18 replaced in the decoded frame cache according to a least recently used policy.

19 23. (Original) The article of claim 15, wherein an index is used to represent
20 each frame in the frame dependency.

21 24. (Original) The article of claim 15, wherein the frame dependency is
22 determined through a look-up table.

1 25. (Original) The article of claim 24, wherein the frame dependency is
2 determined through successive uses of a look-up table.

3 26. (Currently Amended) A computer system including:
4 a processor and video processing circuitry;
5 a display; and
6 memory including instructions which when executed cause the processor and
7 video processing circuitry to:

8 (a) detect a request to randomly access a particular frame; and

9 (b) maintain a list of frame dependencies identifying at least a set of frames
10 required to decode the particular frame;

11 (c) determine whether a decoded version of the particular frame is in a decoded
12 frame cache, said cache configured to store an arbitrary number of previously decoded
13 frames, and if it is not and if the particular frame has a frame dependency:

14 (i) determine a frame dependency for the particular frame;

15 (ii) determine which of the frames in the frame dependency are in the
16 decoded frame cache;

17 (iii) decode any frame in the frame dependency that is not in the decoded
18 frame cache and place it in the decoded frame cache; and

19 (iv) use at least and of the decoded frames in the frame dependency to
20 decode the particular frame to create a decoded version of the particular frame.

21 (d) provide the decoded version of the particular frame for displaying on the
22 display.

23 27. (Previously Presented) A method for randomly accessing a first frame
24 of a video stream, comprising:

25 maintaining a list of frame dependencies identifying at least a set of frames
26 required to decode the first frame;

27 determining a decoding of the first frame is not in a decoded frame cache;

1 determining, based at least in part on the list of frame dependencies, a first frame
2 dependency for the first frame comprising frames required to decode the first frame;
3 decoding at least one of the frames of the frame dependency not present in the
4 decoded frame cache, and placing it in the decoded frame cache; and
5 decoding the first frame using at least one of the decoded frames in the decoded
6 frame cache.

7 28. (Original) The method of claim 27, further comprising:
8 decoding each frame of the frame dependency not present in the decoded frame
9 cache, and placing them in the decoded frame cache.

10 29. (Original) The method of claim 27, further comprising:
11 recursively decoding the second frame of the frame dependency.

12 30. (Original) A method according to claim 27 for reverse playback of
13 frames of the video stream, comprising:
14 determining a second frame is not in the decoded frame cache, the second frame
15 following the first frame in the video stream;
16 determining a second frame dependency for the second frame comprising
17 frames required to decode the second frame;
18 decoding at least one of the frames of the frame dependency not present in the
19 decoded frame cache, and placing it in the decoded frame cache; and
20 decoding the second frame using at least one of the decoded frames in the
21 decoded frame cache.

22 31. (Original) The method of claim 30, further comprising:
23 playing the second frame and then the first frame.

24 32. (Original) The method of claim 30, wherein the second frame is an
25 immediately following frame of the first frame.

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2 33. (Currently Amended) An article comprising a machine-accessible
3 media having associated data for randomly accessing a first frame of a video stream,
4 wherein the data, when accessed, results in a machine performing:
5 maintaining a list of frame dependencies identifying at least a set of frames
6 required to decode the first frame;
7 determining a decoding of the first frame is not in a decoded frame cache, said
8 cache configured to store an arbitrary number of previously decoded frames;
9 determining, based at least in part on the list of frame dependencies, a first frame
10 dependency for the first frame comprising frames required to decode the first frame;
11 decoding at least one of the frames of the frame dependency not present in the
12 decoded frame cache, and placing it in the decoded frame cache; and
13 decoding the first frame using at least one of the decoded frames in the decoded
14 frame cache.

15 34. (Original) The article of claim 33 wherein the machine-accessible
16 media further includes data, when accessed, results in the machine performing:
17 decoding each frame of the frame dependency not present in the decoded frame
18 cache, and placing them in the decoded frame cache.

19 35. (Original) The article of claim 33 wherein the machine-accessible
20 media further includes data, when accessed, results in the machine performing:
21 recursively decoding the second frame of the frame dependency.

22 36. (Original) The article of claim 33 wherein the machine-accessible
23 media further includes data for reverse playback of frames of the video stream, when
24 accessed, results in the machine performing:
25 determining a second frame is not in the decoded frame cache, the second frame
26 following the first frame in the video stream;

1 determining a second frame dependency for the second frame comprising
2 frames required to decode the second frame;
3 decoding at least one of the frames of the frame dependency not present in the
4 decoded frame cache, and placing it in the decoded frame cache; and
5 decoding the second frame using at least one of the decoded frames in the
6 decoded frame cache.

7 37. (New) A method of caching decoded frames of a video in a decoded
8 frame cache configured to store an arbitrary number of previously decoded frames,
9 comprising:
10 maintaining a list of frame dependencies identifying at least a set of frames
11 required to decode a particular frame of the video;
12 determining based at least in part on the list of frame dependencies that a
13 decoded version of the particular frame is not in the decoded frame cache; and
14 determining if the particular frame has a frame dependency, and if so:
15 determining a frame dependency for the particular frame,
16 determining which of the frames in the frame dependency are in the
17 decoded frame cache,
18 decoding any frame in the frame dependency that is not in the decoded
19 frame cache and placing it in the decoded frame cache, and
20 using at least one of the decoded frames in the frame dependency to
21 decode the particular frame to create a decoded version of the particular frame.

22 38. (New) The method of claim 37, further comprising:
23 detecting a request to randomly access the particular frame;
24 wherein the request to playback the particular frame is part of a request to
25 perform frame-by-frame backward playback.